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Mercury and Medicine: A Controversial Alliance

Benjamin Estrada, MD, University of South Alabama, Mobile

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Mercury is a precious metal, which for many years has been used for multiple medical purposes. Today's symbol of the medical professions, the caduceus, was also the ancient symbol of the mythologic Roman messenger of the gods, who bears the same name as this metal. Mercury is present in medical measurement devices, such as thermometers and sphygmomanometers, and is a component of dental amalgam and of antiseptics such as thimerosal. However, mercury is also a substance with toxic properties, which have been known since ancient times. Sufficient exposure to mercury has been reported to result in a triad of symptoms, which include erethism, tremor, and gingivitis. More subtle effects of mercury exposure are its nephrotoxic and neurotoxic activity, which can lead to behavioral and cognitive changes as well as damage to the developing brain (Clarkson TW. Crit Rev Clin Lab Sci.1997;34:369-403). Humans are exposed to different organic and inorganic forms of mercury, which include methyl mercury and mercury vapor. The primary environmental exposure to mercury is from consumption of fish.

Several United States agencies, including the FDA, the Environmental Protection Administration, and the Agency for Toxic Substances and Disease Registry, have developed guidelines for upper limits for daily exposure of mercury; these vary from 0.1 to 0.4 µg/kg/d. A recent concern has been raised about the presence of thimerosal in vaccines. On July 7, 1999, the American Academy of Pediatrics (AAP) and the Public Health Service issued a statement alerting the public to the presence of thimerosal in vaccines (MMWR.1999; 48:563-565). Although thimerosal has been used as a preservative in vaccines for more than 40 years, it has been observed that with the introduction of additional immunizations, such as the hepatitis B vaccine, children could be exposed to higher doses of mercury than those recommended by the above-mentioned agencies. This exposure occurs mainly during the first 6 months of life, which is the time when the primary series are given. For example, an infant immunized for the primary series with thimerosal-containing DTaP (25 µg Hg/0.5 mL), Hib (25 µg Hg/0.5 mL), and hepatitis B (12.5 µg Hg/0.5 mL) products could receive up to 187 µg of mercury during the first 6 months of life. Although at this time there is no evidence that mercury present in vaccines has directly produced any deleterious effects in humans, it is because of its potential risks that reduction or elimination of the use of thimerosal-containing vaccines has been recommended.

A large variety of thimerosal-free pediatric vaccines should be available in the near future. Until those products are available, practitioners should be aware that there are different options for maintaining adequate immunization rates at the present time.

Some of these options include:

- Minimize thimerosal exposure by stopping hepatitis B immunization during the neonatal period and administering COMVAX (Hepatitis B-Hib thimerosal-free product) at 2, 4, and 12 months of age unless the infant is born to an HBsAg-positive woman.
- Administering all the hepatitis B vaccine doses after 6 months of age and not in conjunction with thimerosal-containing DTaP and Hib, which are routinely given during the primary series, unless the child is born to an HBsAg-positive woman.
- Administering a 100% thimerosal-free schedule using the available thimerosal-free products on the market, such as InfanrixTM (DTaP), COMVAXTM, PedvaxHibTM (Hib), ActHibTM (Hib), OmniHibTM (Hib). An example of an immunization schedule with thimerosal-free products is shown in the Table.

To protect against infections that represent an immediate threat to children, it has been recommended that if no other options are available, the use of products containing thimerosal is preferable to withholding the immunizations.

Practitioners should remember to discuss with parents and medical staff the different options available, which should make it unnecessary to withhold or delay the administration of immunizations.

Dr Estrada is assistant professor of pediatrics, division of pediatric infectious diseases, University of South Alabama, Mobile.